1671
E9

NEWPORT

201A DC VOLTMETER
201AN DC VOLTMETER
201AN-AC AC VOLTMETER

10148ML-02

OWNERS MANUAL

CHG	EO NO	DATE	BY	CHK
D	5829	27JUN 88	SSz	

TABLE OF CONTENTS

1.0	GENERAL INFORMATION	1
1.1	Models 201A and 201AN	1
1.2	Model 201AN-AC	1
2.0	SPECIFICATIONS	2
2.1	Analog Input	2
2.2	Accuracy at 25°C	2
2.3	Noise Rejection	2
2.4	Analog-To-Digital Conversion	2
2.5	3-Wire Ratio Reference	3
2.6	Display	3
2.7	Digital Signals	3
2.8	Power	3
2.9	Environmental	3
2.10	Mechanical	3
3.0	MECHANICAL ASSEMBLY AND INSTALLATION	4
3.1	Safety Considerations	4
3.2	Panel Mounting	5
4.0	POWER AND SIGNAL	8
4.1	Changing Operating Voltage	8
4.2	Power and Signal Connections	8
4.3	Connector Pin Assignments	10
4.4	Digital Test Signals	11
5.0	CONFIGURATION	11
5.1	Decimal Point Selection	11
5.2	Voltage Range Selection	12
5.3	Blanking Least-Significant Digit	12
6.0	CALIBRATION	13
6.1	DC Voltage Ranges	13
6.2	AC Voltage Ranges	13
7.0	DRAWINGS	14

ILLUSTRATIONS

Figure 3-1	DIN Case Dimensions	5
Figure 3-2	Exploded View of Model 201A	7
Figure 4-1	Main Board	8
Figure 4-2	Rear Terminal	8
Figure 5-1	Display Board Jumper Locations	11
Figure 5-2	Main Board Jumper Locations	12
Figure 5-3	Solder-Switch Locations	13
Figure 7-1	Assembly Diagram	15
Figure 7-2	Schematic Diagram	15

1.0 GENERAL INFORMATION

The 201A, 201AN and 201AN-AC are different pinout versions of the same 3 1/2 digit panel meter for applications which require a compact, quality dc voltmeter. Standard features include HOLD function, selectable decimal point location and LAMP TEST.

Each model contains the circuitry for all ranges. The range is changed by opening and closing the appropriate switches on the printed circuit board via installation of push on jumpers.

1.1 MODELS 201A AND 201AN

Model 201AN is pin-compatible with Newport's 202A, 2001 and 2002A series. Models 201A and 201AN have a resolution of 1 part in ±1999 counts, or 0.05% of full scale. By using an external dc voltage reference, any of these ranges can be configured for 3-wire ratio measurement with readout from 0 to 1.999.

1.2 MODEL 201AN-AC

Model 201AN-AC, for AC power-line monitoring, has a screw-terminal barrier strip for signal and power. This model uses a half-wave average converter calibrated to read RMS. It offers input ranges of 199.9 and 650 V ac, with resolution of 100 mV and 1 V, respectively. Maximum rated input in either range is 650 V RMS or 920 Vp.

2.0 SPECIFICATIONS

2.1 ANALOG INPUT

*Models **201A** and **201AN***

Signal ranges	±199.9 mV	±1.999 V	±19.99 V	±199.9 V
Bias current	50 pA	50 pA	5 pA	1 pA
Maximum input	130 Vp	130 Vp	250 Vp	250 Vp
Resolution	100 uV	1 mV	10 mV	100 mV
Input resistance	1 GΩ	1 GΩ	1.1 MΩ	1.0 M^N8,50

Configuration	Differential, bipolar
Zero	Automatic
Span adjustment	±5%

*Model **201AN-AC***

Signal ranges	199.9 V ac	650 V ac
Bias current	1 pA	1 pA
Overvoltage protection	650 V ac	650 V ac
Resolution	100 mV	1 V ac
Input resistance	1 MΩ	1 MΩ

Configuration	Half-wave average, RMS-calibrated
Zero	Automatic
Frequency	47-1000 Hz

2.2 ACCURACY AT 25°C

Warmup to rated accuracy	10 minutes

*Models **201A** and **201AN***

Maximum error	±0.05% or reading ±1 count
Span to tempco	±0.01% of reading/°C
Step response	1 second

*Model **201AN-AC** (10% to 100% of full-scale range)*

Maximum error (actual reading)	
20.00 to 199.99 V range	±0.003%FS (R-110 V) / V ±1 count
20.0 to 650.0 V range	±0.0003%FS (R-220 V) / V ±1 count
Span to tempco	±0.01% of reading / °C
Step response	1 second

2.3 NOISE REJECTION

NMR	56 dB at 50/60 Hz
CMR, SIG LO to SIG GND	80 dB, DC to 60 Hz
CMV, SIG LO to SIG GND	±1.0 Vp
CMR, AC GND to SIG GND	120 dB, DC to 60 Hz
CMV, AC GND to SIG GND	1500 Vp per HV test; 354 Vp per IEC spacing

2.4 ANALOG-TO-DIGITAL CONVERSION

Technique	Dual-slope, average-value
Read rate	2.5/second
Input integration period	100 milliseconds

2.5 3-WIRE RATIO REFERENCE

*Models **201A** and **201AN***

Analog input range	±200 mV, ±2 V, ±20 V, ±200 V	
Reference voltage	+0.05 to +0.2 V	+0.5 to 2.0 V
Load on reference	30.6 ohms	65.3 ohms
Accuracy	99.9%R	99.9%R

2.6 DISPLAY

Type	7-segment, red LED; 14.2 mm (0.56 in)
Symbols	
201A & 201AN	-1.8.8.8
201AN-AC	1.8.8.8
Decimal points	Three positions programmable internally or at connector
Overrange indication	Three least-significant digits blank

2.7 DIGITAL SIGNALS (Referenced to SIG GND)

Logical 0	0 to +1.4 V
Logical 1	+3.7 V to +5.0 V
Display HOLD	1 = latched reading
LAMP TEST	1 = display of -1888
Output voltage	+4.7 V dc ±5% at 10 mA max
	-4.6 V dc ±5% at 10 mA max

2.8 POWER

AC input voltage	115 or 230 V ac ±15%
AC frequency range	49 to 440 Hz
DC input voltage	9-32 V dc, isolated to 300 Vp
	26-56 V dc, isolated to 300 Vp
Power consumption	2.4 W (nominal)

2.9 ENVIRONMENTAL

Operating temperature	0 to +60°C
Storage temperature	-40 to +85°C
Relative humidity	95% at +40°C (non-condensing)

2.10 MECHANICAL

Bezel	96 x 48 x 6.1 mm (3.78 x 1.89 x 0.24 in)
Depth behind bezel, with connector	99 mm (3.90 in)
Panel cutout	92 x 45 mm (3.62 x 1.77 in)
Weight	400 g (14 oz)
Case material	94V-O UL-rated polycarbonate
D1 connector:	18-pin, double-row, 3.96 mm (0.156 in) pin spacing
D4 connector:	Screw-terminal barrier strip for signal and power (removes these inputs from D1)

3.0 MECHANICAL ASSEMBLY AND INSTALLATION

3.1 SAFETY CONSIDERATIONS

This instrument is protected according to Class I (Protective Earth) of the IEC (International Electrotechnical Commission) 348 and the VDE 0411 regulations. To ensure safe operation, follow the guidelines below:

VISUAL INSPECTION: Do not attempt to operate the instrument if damage is found.

POWER VOLTAGE: This instrument is delivered with the AC power input connected for 240 V ac in Europe (C1 option) or 120 V ac in the USA (unless the instrument is provided with the DC power input option). Verify that the instrument is connected for the correct power voltage rating before using. If incorrect, make the required change as described in Section 4, Changing Operating Voltage.

POWER WIRING: This instrument has no power switch; it will be in operation as soon as the power is connected.

Verify that the power cable has the proper ground (earth) wire and that this wire is properly connected to an adequate ground (earth) point. The meter must be grounded in accordance with the latest local safety regulations.

If AC, the power cable must contain a protective ground conductor which is not disconnected (open) either inside or outside the instrument. No extension cables without grounding wires shall be used.

SIGNAL WIRING: Do not make signal wiring connections or changes while power is on.

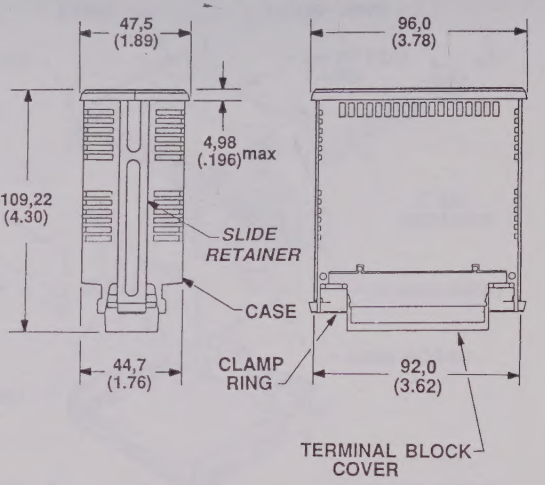
RAIN OR MOISTURE: Do not expose the instrument to condensing moisture.

FUMES AND GASES: Do not operate the instrument in the presence of flammable gases or fumes.

EXERCISE CAUTION: As with any electronic instrument, high voltages may be exposed when attempting to install, calibrate, or remove parts of the meter.

3.2 PANEL MOUNTING

NOTE: Dimensions are in millimeters ±0,25 mm and inches are in ( ) ±0.01 in



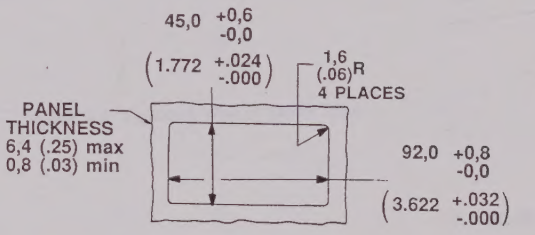


Figure 3-1 DIN Case Dimensions

1. Remove the main board edge connector (J1) if installed.

2. Use a #8 Phillips-head screwdriver to loosen the two screws on the rear of the case until you can rotate the two clamp rings. Loosen the screws enough to allow for the panel thickness.

3. Slide the two slide retainers towards the rear of the unit and remove them.

4. Observe the case dimensions previously shown. From the front of the panel, insert the meter into the panel cutout.

5. Slide the slide retainers back onto the case and push up tightly against the rear of the panel.

6. Rotate the clamp rings back into their original position and tighten until the case is held in place. Do not overtighten.

7. Reinstall any connectors that were removed.

WARNING: HIGH VOLTAGE IS PRESENT WHEN USING MODEL 201AN-AC WITH THE 650 V AC OPTION.

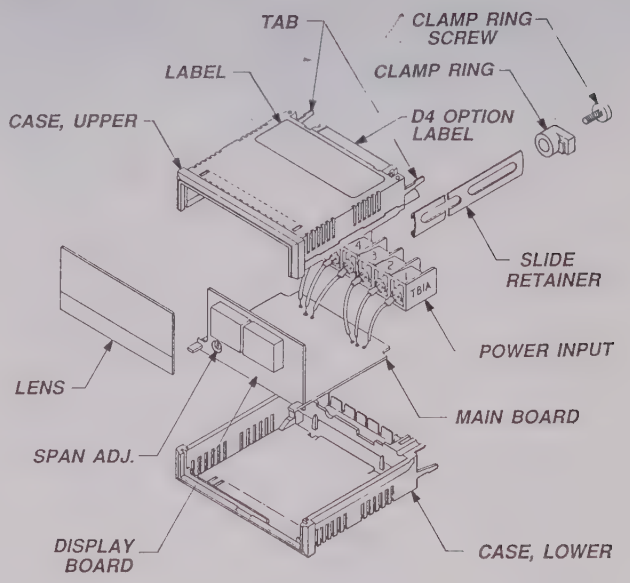


Figure 3-2 Exploded View of Model 201A

4.0 POWER AND SIGNAL

4.1 CHANGING OPERATING VOLTAGE

Remove power lines from the meter, then remove the meter from the case.

OPERATING VOLTAGE	JUMPER INSTALLATION
230 V ac ±15% (Option C1)	Remove W8 and W9 *on the transformer* Install W4 *on the printed circuit board*
115 V ac ±15% (Standard)	Install W8 and W9 *on the transformer* Remove W4 *on the printed circuit board*

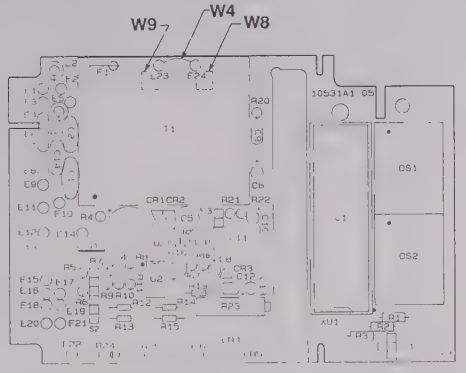
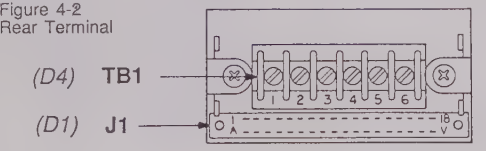


Figure 4-1
Main Board

4.2 POWER AND SIGNAL CONNECTIONS

Models 201A, 201AN and 201AN-AC are factory-set for 115 V ac ±15% operation. Power and signal can be connected using the D1 or D4 option.

Figure 4-2
Rear Terminal



Refer to Figure 4-2.

		POWER		SIGNAL	
MODEL 201A					
AC	D1 Connector	A	High	V	High
		C	Low	T	Low
		E	Ground	S	Ground
	D4 Connector	1	High	6	High
		2	Low	5	Low
		3	Ground	4	Ground
DC	D1 Connector	C	+ DC	V	High
		E	- DC (return)	T	Low
				S	Ground
	D4 Connector	1	No connection	6	High
		2	+ DC	5	Low
		3	- DC (return)	4	Ground
MODEL 201AN					
AC	D1 Connector	A	High	17	High
		2	Low	16	Low
		C	Ground	T	Ground
	D4 Connector	1	High	6	High
		2	Low	5	Low
		3	Ground	4	Ground
DC	D1 Connector	2	+ DC	17	High
		C	- DC (return)	16	Low
				T	Ground
	D4 Connector	1	No connection	6	High
		2	+ DC	5	Low
		3	- DC (return)	4	Ground
MODEL 201AN-AC					
	D4 Connector	1	High	6	High
		2	Low	5	Low
		3	Ground	4	Ground

Wire Color for AC Power	*USA*	*Other*
(High)	*Black*	*Brown*
(Low)	*White*	*Blue*
(Ground)	*Green*	*Green*

4.3 CONNECTOR PIN ASSIGNMENTS

201A J1 Connector (D1 Option)

AC HI	A	1	N/C
N/C	B	2	N/C
AC LO/+DC PWR	C	3	N/C
N/C	D	4	N/C
AC GND/-DC PWR	E	5	N/C
N/C	F	6	DIG GND
199.9 DP	H	7	199.9 DP
19.99 DP	J	8	19.99 DP
1.999 DP	K	9	1.999 DP
LAMP TEST	L	10	LAMP TEST
4.7 V	M	11	+4.7 V
-4.6 V	N	12	-EXC
+REF	P	13	+EXC
HOLD	R	14	HOLD
ANA GND	S	15	Spare
SIG LO	T	16	Spare
N/C	U	17	Spare
SIG HI	V	18	N/C

201AN J1 Connector (D1 Option)

AC HI	A	1	N/C
N/C	B	2	AC LO/+DC PWR
AC GND/-DC PWR	C	3	N/C
N/C	D	4	N/C
Spare	E	5	N/C
N/C	F	6	DIG GND
199.9 DP	H	7	199.9 DP
19.99 DP	J	8	19.99 DP
1.999 DP	K	9	1.999 DP
LAMP TEST	L	10	LAMP TEST
+4.7 V	M	11	+4.7 V
-4.6 V	N	12	-EXC
+REF	P	13	+EXC
HOLD	R	14	HOLD
ANA GND	S	15	Spare
SIG LO	T	16	SIG LO
N/C	U	17	SIG HI
Spare	V	18	N/C

201AN-AC J1 Connector (D1 Option)

Spare	A	1	N/C
N/C	B	2	N/C
Spare	C	3	N/C
N/C	D	4	N/C
Spare	E	5	N/C
N/C	F	6	N/C
199.9 DP	H	7	199.9 DP
19.99 DP	J	8	19.99 DP
1.999 DP	K	9	1.999 DP
LAMP TEST	L	10	LAMP TEST
+4.7 V	M	11	+4.7 V
-4.6 V	N	12	-EXC
+REF	P	13	+EXC
HOLD	R	14	HOLD
Spare	S	15	Spare
Spare	T	16	Spare
N/C	U	17	Spare
Spare	V	18	N/C

Connector TB1 (D4 Option)

AC Power Versions		DC Power Versions	
1	AC HI	1	N/C
2	AC LO	2	+DC PWR
3	AC GND	3	DC PWR RET
4	ANA GND	4	ANA GND
5	SIG LO	5	SIG LO
6	SIG HI	6	SIG HI

4.4 DIGITAL TEST SIGNALS

Display HOLD instructs the meter to maintain a display of the last reading. To activate HOLD, connect J1-pin 14/R to J1-pin 11/M.

LAMP TEST instructs the meter to light the minus sign and all digits on the display to verify that the display is operating properly. To test the display, connect J1-pin 10/L to J1-pin 11/M. The decimal point does not light when LAMP TEST is activated.

5.0 CONFIGURATION

Select the desired configurations from the following charts. Install jumpers and open/close solder switches as indicated. Remove all push-on jumpers not used.

5.1 DECIMAL POINT SELECTION

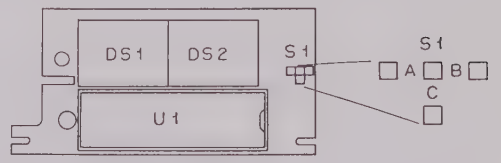


Figure 5-1 Display Board Jumper Locations

Decimal Point	S1	Alternate decimal point configuration using main board connector J1.
1.999	A	Connect K/9 to 6
19.99	C	Connect J/8 to 6
199.9	B	Connect H/7 to 6

5.2 VOLTAGE RANGE SELECTION

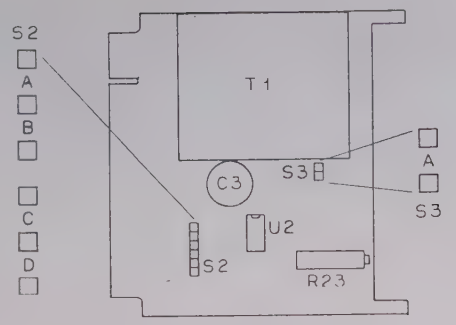


Figure 5-2 Main Board Jumper Locations

Input Configuration	Solder Switches *		Push-on Jumpers	
	Open	Close	S2	S3
200 mV dc	-	-	A	A
2 V dc	-	-	B	-
20 V dc	-	-	B, C	-
200 V dc	-	-	B, D	-
200 V ac	I	G, K, J	B	-
650 V ac	I	H, K, J	B	-
True-differential	C	-	-	-

* Refer to Figure 5-3 on the following page for solder switch locations.

5.3 BLANKING LEAST-SIGNIFICANT DIGIT

To blank the least-significant digit, open solder switch 'A' on the circuit side of the display board.

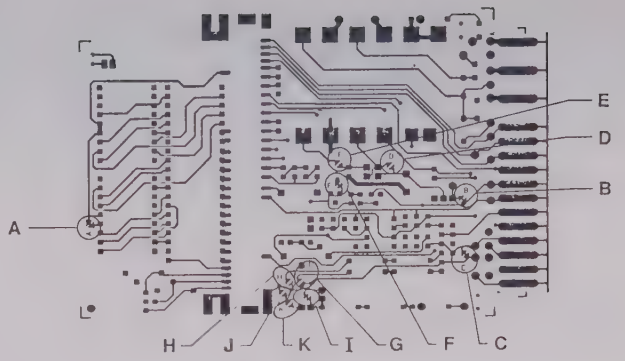


Figure 5-3 Solder Switch Locations

6.0 CALIBRATION

6.1 DC VOLTAGE RANGES

1. Remove the front lens. Insert a blade screwdriver under the notch at the bottom of the lens and gently pry it off.
2. Short the input signal connections and verify that the display reads zero.
3. Apply an input voltage equal to 95% of the high end of the range selected.
4. Locate the Span potentiometer (R23) in Figure 3-1. Adjust until the display reads 1900 ±1 count.

6.2 AC VOLTAGE RANGES

1. Follow steps 1 and 2 from above.
2. Apply an input voltage equal to 110.0 V ac at 50 or 60 Hz on 200 V ac range or 220 V ac at 50 or 60 Hz on 650 V ac range.
3. Locate the Span potentiometer (R23) in Figure 3-1. Adjust until the display reads:

   110.0 on 200 V ac range
   220 on 650 V ac range

Figure 7-2 Schematic Diagram

Figure 7-1 Assembly Diagram

WARRANTY

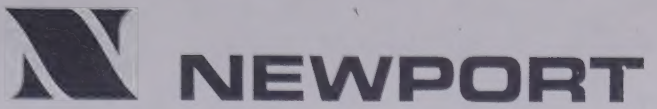
All products from Newport Electronics are warranted against defective material and workmanship for a period of one (1) year from date of delivery.

If you have purchased a Newport product from an authorized Newport distributor and that product appears to have a defect in material or workmanship or fails during normal use within the warranty period, please contact the distributor from whom you have purchased the product. Most authorized Newport distributors have full service capability and provide warranty service under contract with Newport.

If you have purchased a Newport product directly from Newport and that product appears to have a defect in material or workmanship or fails during normal use within the warranty period, please call or write Newport. Refer to the back cover for the appropriate office location. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

Newport's warranty does not apply to defects resulting from action of the buyer, such as mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification.

No other warranties are expressed or implied. Newport Electronics specifically disclaims any implied warranties of merchantability or fitness for a specific purpose. The remedies outlined above are the buyer's only remedies. Newport Electronics will not be liable for direct, indirect, special, incidental or consequential damages whether based on contract, tort or other legal theory.



Newport Electronics, Inc.
630 E. Young Street
Santa Ana, CA 92705-5687
Phone: (714) 540-4914
FAX: (714) 546-3022
TWX: 910-595-1787
(NEWPORT LABS)

Newport Electronics B.V.
Postbus 8034
1180 LA Amstelveen
The Netherlands
Phone: (020) 418405
Telex: 11688
(NEWPT NL)

Newport Electronics GmbH
7269 Deckenpfronn
Gaustrasse 28-30
German Federal Republic
Phone: (07056) 3017
Telex: 726157
(NEWPORT D)

Newport Electronics Ltd.
Cavendish Road
Stevenage, Herts
England SG1 2ET
Phone: (0438) 365671
FAX: (0438) 356203
Telex: 826454
(NEWPEL G)

Newport Electronique S.A.R.L.
9 rue Denis Papin
78190 Trappes
France
Phone: (1) 30.62.14.00
Telex: 697797
(NEWPORT F)